

**WT Docket 06-142 • Increased Power and Other Changes
for 173.075 MHz SVRS Base and Mobile Stations**

Statement of Hammett & Edison, Inc., Consulting Engineers

The firm of Hammett & Edison, Inc., Consulting Engineers, has been retained by the Association for Maximum Service Television, Inc. (MSTV) to prepare this engineering exhibit in support of MSTV comments to WT Docket 06-142. This rulemaking proposes to double the allowable effective radiated power for 173.075 MHz stolen vehicle recovery systems (SVRS) such as the SVRS system provided by Lojack Corporation (Lojack). The Notice of Proposed Rulemaking (NPRM) also proposes changes to the modulation type, duty cycle, and permissible uses for SVRS.

I. A 2.0 dB Bandwidth Reduction Does Not Justify a 3.0 dB Power Increase

1. In the Lojack Petition for Rulemaking that resulted in this instant NPRM, Lojack noted that it must narrow the bandwidth of its 173.075 MHz transmissions from 20 kHz to 12.5 kHz, and accordingly requested an offsetting increase in the allowable effective radiated power (ERP) for SVRS base stations from 300 watts to 500 watts, and increasing the allowable transmitter power output (TPO) for mobile vehicle locator unit (VLU) transmitters from 2.5 watts to 5.0 watts. However, Lojack fails to explain why a 2.0 dB decrease in bandwidth should require a 2.2 dB increase in base station power and a 3.0 dB increase in VLU power.

**II. Proposed Changes Should Not Be Allowed Until an Updated “MicroLogic Report,”
Applicable to DTV Stations, Is Available**

2. In the General Docket (GD) 88-566 rulemaking which created the SVRS service, the Commission relied heavily on a report by MicroLogic, Inc. (MicroLogic), submitted on Lojack’s behalf, deriving the signal ratios needed to ensure that a 173.075 MHz SVRS signal would not cause interference to an NTSC TV Channel 7 signal. According to Footnote 22 of the October 16, 1989, GD Docket 88-566 Report and Order (R&O), the Commission found that the MicroLogic Report was “similarly appropriate for analyzing interference to TV Channel 7 from operations on 173.075 MHz” as was the July 1982 OST 82-5 Technical Memorandum (TM) “Guidance for Evaluating the Potential for Interference to TV from Stations of Inland Waterways Communications Systems” report for predicting AMTS interference into VHF high band TV stations. The footnote noted that the MicroLogic Report found that a ratio of 8 dB for an NTSC Channel 7 City Grade (77 dBu) signal, a ratio of 9 dB for an NTSC Channel 7 Grade A (71 dBu) signal, and a ratio of 11 dB for an NTSC Channel 7 Grade B (56 dBu) signal, all resulted in “just perceptible” interference, and that “these values appear to be reasonable.”

3. The above referenced footnote unfortunately did not indicate whether these ratios were undesired-to-desired (U/D) ratios or desired-to-undesired (D/U) ratios. While the MicroLogic Report



**WT Docket 06-142 • Increased Power and Other Changes
for 173.075 MHz SVRS Base and Mobile Stations**

used these as U/D ratios, the OET TM 82-5 report used D/U ratios. It would be illogical to conclude that a less stringent D/U protection ratio would apply as the NTSC Channel 7 signal strength increased since, in general, the stronger the Channel 7 signal strength the better the picture quality, and a high-quality analog TV signal is more susceptible to “just perceptible” interference than an analog TV signal at its Grade B limit, where visible noise exists in the picture; that is, this noise masks, to a certain degree, interference that would otherwise be visible. Thus, the ratios given in Footnote 22, even though citing OST TM 82-5, which used D/U ratios, must, in fact, be U/D ratios.

4. It should be intrinsically obvious that ratios derived for protection of an analog TV signal having a Grade B signal threshold of 56 dBu, and based on an interfering signal using frequency modulation (FM) and a duty cycle of 200 mSec every 10 seconds (1.2 seconds per minute), are not applicable to the ratios for protection of a digital TV signal having a DTV threshold of 36 dBu, and based on an interfering signal using digital modulation and a duty cycle of 5 seconds per minute. Additionally, and as noted at Paragraph 20 of the NPRM, whereas interference to an analog TV signal results in progressive degradation as the interfering signal becomes stronger or the desired signal becomes weaker (*i.e.*, a “fail gracefully” mode), interference to a digital signal is typically a step function: the digital TV signal will transition quickly from a perfect picture to blue-screen squelch.

5. Thus, it is impossible to gauge the impact of a possible 3 dB power increase, a 7 dB duty cycle increase, and the switch from FM to digital modulation by an interfering 173.075 MHz SVRS signal to a digital TV Channel 7 signal without detailed laboratory measurements of the susceptibility of consumer-grade 8VSB receivers to the new SVRS signals (plural, since the interference potential of an SVRS base station using digital modulation could well be different from the interference potential of a VLU using digital modulation). Thus, until comprehensive laboratory measurements testing the new, digital SVRS and VLU signals against a reasonable universe of consumer-grade 8VSB DTV receivers has been performed, no one, not Lojack, not the FCC, nor broadcasters, can evaluate the interference potential of the proposed changes.

6. It should be noted that a 3.0 dB increase in the TPO for VLU transmitters would be problematic, since because of their mobile nature only statistical interference studies would be possible. To minimize the likelihood of signals from VLU transmitters causing intermittent but chronic interference to DTV Channel 7 reception (*i.e.*, a “death by a thousand knife cuts” problem), the power increase for VLUs operating in a 12.5 kHz channel bandwidth should be limited to 2.0 dB (*i.e.*, 4.0 watts TPO). Although the NPRM tentatively concludes, at Paragraph 11, that justification for a power increase for SVRS base stations has not been demonstrated, at least any power increase for an SVRS base station would be accounted for in the Channel 7 interference study, which is based on signal ratios.



**WT Docket 06-142 • Increased Power and Other Changes
for 173.075 MHz SVRS Base and Mobile Stations**

III. The Requirement for Channel 7 Interference Studies Must Be Retained

7. At Paragraph 19, the NPRM explains that Lojack characterizes the Channel 7 interference studies presently required for new or modified SVRS base stations as “technically and financially onerous, with no demonstrable benefit.” To investigate this allegation, the Universal Licensing System (ULS) was searched for SVRS applications, to see the nature of the interference studies that had been filed. A total of 179 such applications were found. All of the sampled interference studies turned out to be done by two firms, and used identical language. The studies cited the MicroLogic report, and reported the number of persons within the calculated Channel 7 interference area. However, the reports then went on to conclude that the actual population suffering interference would be smaller, since the signal strength of the studied TV Channel 7 station might be stronger than predicted, or the TV receiver might have better rejection of the undesired SVRS signal than specified in the MicroLogic Report.

8. Unfortunately, it is just as likely that the TV Channel 7 receiver might have worse rejection of the undesired SVRS signal, since the MicroLogic Report was based on median receiver performance. And it is also entirely possible that the predicted TV Channel 7 signal strength was under-predicted rather than over-predicted, due to terrain obstruction or, especially in urban areas, due to attenuation by man-made structures.

9. All of the examined Channel 7 interference studies found in the ULS included the statement that “LoJack has developed a plan to correct any interference which may actually result from the herein [proposed] facility. This plan includes eliminating the LoJack emission at the TV set with a filter.” However, none of the examined interference studies included any details of the Lojack “plan,” or the performance characteristics of the filter.

10. Several SVRS applications found in the ULS, all of which show “granted,” included a supplemental exhibit, explaining that the ULS will not allow keying in the capital letter “K,” meaning a times-one-thousand multiplier for the number of mobile VLU transmitters being requested. The attached Figure 1 shows the supplemental exhibit to the WPUU729 SVRS application. Thus, instead of 750 VLU transmitters, this application, and many other SVRS applications, have been requesting authority for 750,000 VLU transmitters. Each. When the number of VLU transmitters is this high, it calls into question the assumption in the NRPM that signals from VLU transmitters are unlikely to be a significant interference threat. A statistical modeling study would be needed to determine at what point a very large number of VLU transmitters would constitute, in effect, a steady-state or near steady-state interfering signal.



WT Docket 06-142 • Increased Power and Other Changes for 173.075 MHz SVRS Base and Mobile Stations

11. While it might be reasonable to provide filters to several hundred persons in a small, distant TV Channel 7 market with predicted interference, providing back-of-set SVRS notch filters to potentially thousands or tens of thousands of persons would be patently unreasonable.¹ It can hardly be in the public interest to expect thousands or tens of thousands of viewers to figure out what the problem is, contact their local TV Channel 7 station, and eventually have a custom notch filter installed.

IV. Viability of Filters for DTV Channel 7 Signals

12. Another issue is the viability of 173.075 MHz notch filters. All of the SVRS applications sampled in the ULS promised to provide such filters, if necessary. While the group delay caused by a sharply-tuned 173.075 MHz notch filter might be tolerable for an analog signal, the non-uniform group delay of a 173.075 MHz notch filter across a 6-MHz wide DTV Channel 7 would likely cause fatal impairment to a DTV signal (that is, result in blue screen squelch instead of a perfect picture). Thus, the degradation to a DTV Channel 7 signal by a 173.075 MHz notch filter might make the problem *worse*, since the notch filter would be present all the time, whereas the interfering SVRS signal at least has a duty cycle. Certainly the proposed Lojack notch filter needs to be tested for its impact to a DTV signal.

V. Polarization Issue

13. The MicroLogic Study assumed that all TV Channel 7 signals are horizontally polarized, and therefore applied a 10 dB polarization discrimination factor. However, some TV Channel 7 stations are elliptically or circularly polarized, in which case it is inappropriate to apply any polarization discrimination factor. For example, Station KABC-TV, Los Angeles, uses a circularly-polarized transmitting antenna, meaning that the Channel 7 interference study for Victorville has an order-of-magnitude (10 dB) error, and has under-predicted the Channel 7 interference, as have the other Los Angeles area Channel 7 interference studies. A check of the Commission's Consolidated Data Base System (CDBS) shows that of the 59 full-service TV Channel 7 stations in the United States, six utilize circular polarization.² Thus, any SVRS interference studies involving these stations must not apply any polarization discrimination factor.

14. Thus, not only must the SVRS Channel 7 interference studies *not* be eliminated, a requirement should be added that such studies must be simultaneously served on the affected TV Channel 7 station, so that the TV Channel 7 licensee will have to opportunity to review the study in a timely manner, and, if necessary, file a timely Informal Objection or Petition to Deny.

¹ For example, Section 73.525(c) of the Commission's rules governing noncommercial educational FM (NCEFM) stations places an upper limit of 3,000 persons requiring installation of back-of-TV set filters.

² KABC-TV, Los Angeles; KTBC(TV), Austin, TX; WLS-TV, Chicago; WITN-TV, Washington; WITV, Columbia, SC; and WTVW, Evansville, IN.



**WT Docket 06-142 • Increased Power and Other Changes
for 173.075 MHz SVRS Base and Mobile Stations**

VI. Possible Sensitivity of DTV Receivers To LoJack Duty Cycles

15. Unlike analog TV receivers, where the processing time through electronic circuits demodulating the NTSC signal is on the order of 170 nSec,³ processing times for DTV receivers could be in the 500 to 1,000 millisecond range. For example, a DTV receiver, after demodulating the 8VSB signal, must then apply filtering and error correction, compress redundant data, and finally convert the video and audio signals from digital to analog data, for the last-step video and audio displays to the viewer. This means that DTV receivers could be sensitive to the duty cycle of a SVRS base station, or VLU transmitters. Laboratory tests⁴ are again needed to ensure that consumer-grade DTV receivers do not have duty cycle windows where the effect of a non-steady state signal is worse for certain duty cycles.

VII. Expanded Uses for Lojack

16. The NPRM asks for comment on whether the permissible use for SVRS should be expanded from its present use, which is restricted to the recovery of stolen vehicles, to “general tracking and monitoring.” “General tracking and monitoring” would be such an all-encompassing permissible use as to allow anything. This, in turn, could so increase the frequency of transmissions from mobile transmitters, each with a non-synchronized duty cycle with other VLUs and ATUs, as to possibly raise the interference threat to TV Channel 7 reception from occasional and tolerable to chronic and intolerable.⁵ Until the susceptibility of DTV Channel 7 receivers to a digitally-modulated SVRS signal is known, it would be imprudent to effectively remove any limits on permissible uses for SVRS transmitters.

VIII. Summary

17. The Commission is prudent to be concerned about the impact of SVRS signals to DTV Channel 7 reception. However, until an updated “MicroLogic” report is created, addressing the susceptibility (or, perhaps, the immunity) of consumer-grade DTV receivers to both analog and digitally-modulated SVRS signals, it would be imprudent to allow increased power, longer duty cycles, or digital modulation for SVRS transmissions. The impact of the 173.075 MHz SVRS notch filter, to be added to the back of DTV receivers experiencing SVRS interference, also needs to be determined before any changes to the SVRS rules should be allowed. SVRS Channel 7 interference studies need to take into account that some TV Channel 7 stations use vertical polarization in addition to horizontal

³ See Section 73.687(a)(3) of the FCC Rules.

⁴ It should be noted that in Public Notice DA 06-1813, dated September 11, 2006, the Commission has indicated that the Office of Engineering and Technology (OET) expects to start laboratory tests in March 2007 of the interference rejection capabilities of DTV receivers to Part 15 devices operating on “unused” TV channels.

⁵ For example, of the randomly sampled SVRS applications identified in these comments, several included supplemental exhibits explaining that the ULS would not allow the “K” symbol for the number of requested VLU transmitters: namely, 750K, or 750,000 transmitters. See the attached Figure 1.



**WT Docket 06-142 • Increased Power and Other Changes
for 173.075 MHz SVRS Base and Mobile Stations**

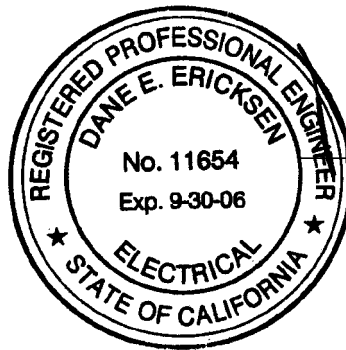
polarization. erAs a safety net, all SVRS applications with a TV Channel 7 station within 169 km (105 miles) should be required to serve a copy of that application, and its associated TV Channel 7 interference study, on the local TV Channel 7 station.

List of Figures

18. In preparing this engineering statement, the following attached figure was prepared under my direct supervision:

1. Example of SVRS application requesting 750 *thousand* VLU transmitters.

September 19, 2006



A handwritten signature in black ink, appearing to read "Dane E. Ericksen", written over a horizontal line.

Dane E. Ericksen, P.E.



Example of SVRS Application Requesting 750 *Thousand* VLU Transmitters
(From the WPUU729 SVRS Application)

PROCESSOR

PLEASE SEE ATTACHED PAGE (S)

REQUESTED ACTION (S) CIRCLED WERE
UNABLE TO BE KEYED AS COMPLETED

33) unable to key "K"

Keyed 750

re



WT Docket 06-142 • Increased Power for 173.075 MHz SVRS Base and Mobile Stations

Example of SVRS Application Requesting 750 *Thousand* VLU Transmitters (From the WPUU729 SVRS Application)

[illegible]FCC 801 - Schedule H
June 2004 - Page 2